

Project 2

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Rationale

Road to Mental Readiness (R2MR) is the chosen app for this project. The main reason for choosing this app over other available options is the app's relevance to me. While the other app offers services for monitoring heart rate and blood pressure, the purpose of R2MR is to improve mental health, which to university students is most relevant. Other minor reasons include the accessibility of the app, in which the Elite HRV app requires an additional aid in the form of a sensor belt, which I do not have to facilitate for the usability testing. As I previously explored from the class, this app has a lot of usability failures, hence a great suit for the evaluation project.

This project will reflect on the design of the app according to the analysis made on the principles of interface design, data visualization, gestalt principles, and accessibility in relation to perceivability and operability. These analyses, alongside with the usability test and cognitive walkthrough performed will be utilized to provide recommendations to the application in terms of design and user experience, and for future reference to human-computer interaction projects and activities.

Interaction Design Analysis

Principles of Interface Design

Wickens' 13 Principles

First, I will be analysing the interface design against the Wickens' 13 principle of display design, which will evaluate against principles that make a good design.

1. Make displays legible (or audible): The main color that R2MR use is the shades of blue, with the red maple leaf as their logo. In bright background colors, the black and dark grey characters are used, whereas white characters are used for other background. On some of the lighter background, light grey text are utilized, which may appear less clear to the user. A serious failure was found in the instruction page of tactical breathing, in which the text is greatly unreadable. One other major thing is the size of the text. Regardless of the phone setting, the size of the texts does not change and hence legibility is very low. Hence, the design does not comply with the first principle.
2. Avoid absolute judgment limits: R2MR's tactical breathing bubble fails this principle, in which the app uses size and color as the indicator for users to breathe in and breathe out. This feature works on the assumption that the user knows when the bubble will start growing or depleting. The principle however states about being careful with pushing the edges of humans' ability to differentiate similar qualities, here the size of the bubble. Size and color are bad indicator of time, and hence fails the second principle.

3. Similarity causes confusion: This principle were successfully applied to 90% of the app. The only problem arise on the tactical breathing function landing page. Here, the [Express mode] button and [Customize your settings] button were designed using the same color shade. This similarity likely cause confusion to the user, thinking that [Express mode] button is another setting or record page, just like the other functions of the R2MR app. Hence, this particular example has failed the third principle.
4. Top-down processing: The icons used in R2MR are mostly in compliance with the normal standard, and hence allow seamless exploration of the app. The sliders design for example can intuitively be used even without reading the instruction, as it is in compliance with the normal standard. This principle has successfully been applied, and allows for seamless user experience.
5. Redundancy gain: All icons in R2MR are accompanied by text, and settings are available to activate/deactivate audio and text prompts. When activated, these prompts offers the audience what is termed as redundancy gain. This is greatly helpful and has been successfully implemented.
6. Minimizing information access cost: R2MR has a lot of features, and each feature has its own data, settings, and functions. Hence, in general sense information access cost is relatively high. However, in the perspective of each key feature, the page provides a global navigation button in the form of the hamburger menu, where general buttons like [Home], [Results], [Background Information], and [Settings] are generally made available. Hence, this principle was in some part successfully implemented, and requires more attention for improvement on the others.

7. Principle of multiple resources: When audio and text prompt settings are activated according to the user's preference, this principle is greatly implemented. Users can easily process information through the text and audio prompt available in the app, hence a great example of the principle.
8. Proximity compatibility principle: this principle is successfully implemented in the slider function of the tactical breathing page. As the slider is being modified, the number beside the [Stress Level] text changes in accordance to the slider movement. This implementation shows a great implementation of proximity compatibility, and hence can be seen in R2MR.
9. Principle of consistency: Consistency across the key functions are visible, in which to start the function, the arrow is used. This consistency has allow great ease for users to use across all functions. This app hence greatly implemented this principle.
10. Principle of predictive aiding: This principle is crucial to the tactical breathing function of the app, but greatly fails to be implemented. The bubble representing the user's breathing in/out should have been assisted with a predictive aid feature - a countdown to inform the user the remaining time they have. An improvement is needed for this principle.
11. Replace memory with visual information: knowledge of the world: The home, back, and hamburger menu are all in compliance with the knowledge of the world. These features, even without text, still remain clear to the user, hence a great example of replacing memory with the visual information.
12. Principle of pictorial realism: One example fails the principle - the slider. The slider does not vary in size even when utilized, hence does not represent the increase visually.

13. Principle of moving part: There is not much scrolling/movement needed in this app. The slider is an example, and it does comply with the mental model of the users. As the size goes up, the number increases and the user should slide to the right and vice versa. This example shows a successful implementation of the Wickens' principle.

Nielsen's Usability Heuristics

The Nielsen's 10 heuristics help identify any problem associated with the design of user interface. This part of the report will evaluate R2MR against the 10 Nielsen's heuristics.

1. Visibility of system status: every click to a clickable button redirects to the appropriate page in reasonable time. User can easily identify whether their action are successfully performed or not.
2. Match between system and the real world: One minor issue with this heuristic is the manage reminders button on the self-talk key function page, which were accompanied with the wheel icon - normally associated to settings. This might cause minor or major confusion to the user.
3. User control and freedom: Tactical breathing's normal mode version cannot be exited once started. This limits the user control and freedom in cases where the user made a mistake and would like to restart, in which their only choice is to wait and cannot exit freely to their will.
4. Consistency and standards: Overall consistency in this app is greatly implemented. Icons to start uses the '>' icon, which becomes intuitive as the user explore more of the app.

The standards in general has also been achieved, such as the home icon, back arrow icon, and the global hamburger menu button.

5. Error prevention: Relating to the third heuristic, there does not exist an undo button once the normal mode of the tactical breathing starts. This might trigger user frustration which is not a good implementation as user should be able to prevent errors from occurring.
6. Recognition rather than recall: Every icons are accompanied by text, and vice versa. User can reflect on the redundancy gain to understand each function, allowing great ease of usability. User does not need to memorize any icons hence memory load is reduced as well.
7. Flexibility and efficiency of use: Global navigation on each key function are present, hence flexibility and efficiency is generally obtained. The hamburger menu is considered self intuitive as this global navigation type has been implemented to a lot of other application, hence users should be able to know the function without instruction.
8. Aesthetic and minimalist design: Color scheme and designs are kept minimalist. All information across the app are also relevant to the information meant to be shared, without any other unnecessary data.
9. Help user recognize, diagnose, and recover from error: Error message on the attempt to use device to check heart rate is clear and allows user to understand the problem. The instruction saying “Take a new recording of your pulse, and try again” tells the user exactly how they can recover from the error.
10. Help and documentation: The [(?)] button are available across important instructions and the hamburger menu. Where necessary, users can easily access these help and documentation feature of the app.

Data Visualization

Data as variables: upon completing the tactical breathing, R2MR provides a section in which the user can compare their result to their demographic - the user is asked to input their sex and age if they want and compare their mental health performance to others. This data can be interpreted as both categorical (demographic) and numerical (age and result).

Mapping variable types: When mapping quantitative values, position should be the priority and color should be the least utilized. However, R2MR default setting for visual prompt is a sphere that grows in density and color. This is a critical error done by the app to map quantitative value and has caused a major confusion to the user of the app.

Gestalt Principles

Gestalt principles consists of 7 principles suggesting that human brain will attempt to simplify and organize complex images or designs that consist of many elements to a whole. Where applicable, I will be reflecting R2MR upon the 7 principles.

1. Similarity: Groupings based on color seems to fail in one of the key feature, tactical breathing. The express mode and normal mode are shaded in different blue suggesting that the two functions offer unrelated feature, whereas the correct implementation should follow the same color as it falls under the same category. Express mode should not be same in color as settings, as it has no relation. This undermines the call to action for express mode, and users would more likely ignore the feature as a result of the color decision.

2. Continuity: the horizontal sliders to rate stress level is very intuitive and in accordance to the mental model. Higher rating are associated to going right, which is in accordance to the mental model of having increasing values. The numbers are also easily correlated thanks to the horizontal line indicating the function as a slider.
3. Closure: Although this might not be relevant/applicable, the hamburger menu acting as the global navigation may be an example, in which 3 separate lines are perceived as a whole intuitively by the user as it has been widely used, hence the strength of conforming to standards.
4. Proximity: The dot and the number are aligned proportionately and hence user can tell that the dot and number are correlated even without a visible line connecting them. This example can be found in the pre-tactical breathing page where the user are required to rate their stress level.
5. Figure-ground: The background generally does not hinder with the content, as the white background fits nicely to the contrasting color of the focal points (text, icons, shape, buttons). However, on one page (Tactical breathing instruction page), the text is white, while the background is a very light shade of grey. On this particular page, visibility is very low, hence very bad. (Refer to Appendix A)
6. Common region: Although the app uses a lot of lines separating each individual region, the proximity of each icon and corresponding text are very close together, and is a great example of good common region. The (?) and (i) buttons are also placed near the corresponding text, and hence user can tell what the information provides, and would not miss-associate them with other region.

7. Focal point: R2MR does not have any visually stand out features, but important features such as the breathing sphere is displaced strategically so that users can clearly see the key features of each page.

Accessibility

Accessibility assessment assessed the extent to which as many people as possible can effectively use the product. The assessment will be done on two of the four principles; perceivability and operability.

Perceivability: This principle rates on how perceivable the information and components are to the users.

- The app provides option for audio and text prompt. When activated, the user can perceive information in more than one way, increasing accessibility to as many target audience as possible.
- Text alternatives are provided to aid images or icons.
- The app does not consider providing sign language for interactive features, yet text prompt are provided.
- Information are presented in a very simple structure, since the app itself is very minimalist in design.
- Intuitive heading structure with different header levels for different hierarchy is implemented, and hence user are able to intuitively follow the right path of information.
- Page landmarks are always placed at the point where users would be most comfortable looking at, and buttons are mostly placed in the displacement easiest to access by comfortable grip.

- Sequence are ensured by each function redirecting to a different page and having most of these pages with access to a back arrow button to go to a previous page.
- The app failed to provide the text resize feature, and hence the font may be too small to some user.
- Some color does not hold significant meaning, and some instead offer wrong information. This needs improvement.
- Some foreground and background dynamic fails as the wrong color for text is chosen.

Operability: This principles requires features of the app to be operable by the user

- The app is fully touch access.
- Not all features are accessible to the user (e.g. the session time for tactical breathing cannot be modified - it should follow the inhale exhale input hence no user freedom).
- Pause button is present, and countdown is also present and hence user can tell the time- the content.
- The app requires user to follow a chronological order, hence cannot bypass repetitive content.
- Pages are titled accordingly, but some title are not specific to the content and may cause user confusion in terms of understanding the correct action.
- Additional information are present throughout the pages and can be accessed by clicking on the button.
- There exist a global navigation that allows user to traverse through the app quickly and effectively.
- Headings and labels are provided visually.

Usability Testing Plan

The usability test should test the app upon the 4 independent IxD analysis. Since the 4 IxD analysis are often closely linked to one another, the usability test will greatly aid the evaluation of the app's usability. The evaluation methods will revolve around process and outcome-based methods. Conducted through a one-to-one moderated usability testing, the participant will be briefed about all details and related consent of the session. The participant should be made aware of every detail of the project, and should they want to opt out at any time they will be allowed to do so. Compensation will also be provided to the participants. The process is crucial for the facilitator to observe every detailed movement, actions, and words coming out of the participant as this can be used to evaluate the usability of the app. The result of the test will also be greatly utilized to further reflect on the app's performance and possible improvement to the app.

The participant chosen for the one-on-one moderated usability testing is a friend that has never heard of R2MR. Selecting a participant with zero knowledge of the app will bring true usability testing result and will be greatly useful to the project. Participants can be taken from people who have issue with their mental health as that would be the app's main target audience, but this app should be available to anyone since mental health is as crucial to any human. Stress does not only affect those with weak mental health, but can strike anyone and hence relevance is high to any pool of participant. This particular usability testing, as said is a one-on-one moderated testing and hence only 2 parties are involved, the facilitator (and researcher), and the participant.

Observation Study

In this section, I will be writing the script for observation study. In the real conduct, there will be improvisations where necessary.

Introduction: Hello, thank you for your time and effort to participate in this observation. Today we will be conducting a usability testing on the application 'road to mental readiness' or in short R2MR. To brief you about this app, this app is an application focusing on improving the user's mental health through a variety range of approach. In today's session of usability testing, we will focus on one of the primary feature, tactical breathing.

In this observation, you will be taking the role of a participant. At any time, you are required to opt out of this session and won't be penalized. I will facilitate this session as a facilitator, and I will be telling you about the tasks that you need to perform. Please think aloud as you go through the tasks that I will be sharing in a moment. As you go through the tasks, I will observe your actions, expressions, movements, gestures, and comments that you make. Please assume that you are using this app without any expert around you, so all you have is you and the app itself. Please also be honest and speak out every thought that goes through your mind. Before we start, do you have any questions regarding the usability testing?

Now, we will proceed with the usability testing. I will ask you to sit here and place the phone on the table in front of you. Please do not lift the phone so I can see your interaction with the app. Make sure to be comfortable so that the testing can be done smoothly and reflect the most of you. I will be observing across you to see and observe your interaction and expression. In this

usability testing, you are required to undergo the full tactical breathing feature in normal mode.

When you are ready, you may begin.

Observation data

- Participant quickly select tactical breathing with ease
 - They claim that it was rather intuitive and direct
- Participant select normal mode as requested by the task
 - Expression seems at ease and comfortable
- Participant quickly dismissed the disclaimer warning
- Participant paused for a moment before selecting the stress level
 - Expression is a bit focused as they read the description
- Slider appears intuitive to the participant
- Participant read the pulse information and clicked on the (?) button
- Participant felt that the countdown is not intuitive
- Participant don't seem as relaxed as in the earlier stage
- Participant clicked on [Beats/Min] hoping it can be clicked, before clicking the [Beats/10 sec] section
 - Participant expected heartbeat count to be per minute
- Participant saw the text prompt and follow the instruction
- Participant seems a bit awkward (process is 1 minute 20 seconds of awkward silence)
- Participant changed the pace after several iteration of breathing process

- Later claimed that the size is ambiguous and not reflective of the time they should be breathing in and out
- Went through the latter heart rate and stress level page with ease
 - From experience during the pre-tactical breathing
- Observed the information for a moment before saying “is that all?”

Semi-structured Usability Interview

As the facilitator, I will be guiding the participant will post-usability testing interview to get a better understanding of the user's perspective of the app. I tried to design the questions as neutral and informative as possible, and allows the user to elaborate more on their opinions about the app. Scaling questions are avoided, and user freedom are ensured in this interview as well.

Questions and Findings

1. What are the things that you liked or disliked about this model?

Findings: the simplicity of this app is a great plus, but the font size is too small, and the unclear indicator makes it confusing for the user when to breathe in and breathe out since the user cannot tell when to stop (hence they cannot pace themselves properly). The help and documentation aspect is also very good, user can easily refer to them when lost.

2. How would you describe this model's functionality?

Findings: User find that the app is a great tool for mental readiness, the app's main function. The user felt that this app may offer something big for mental health.

3. What would you keep or change about this model?

Findings: User would like to add a timer to indicate the time they need to breathe in/out alongside the visual aid (sphere bubble). User would like to keep all of the icon + text (shows great interest to redundancy gain principle).

4. How likely are you to personally use the app?

Findings: User is intrigued to use the app when they need help with their mental health. Currently, they do not need them as much but will keep as future reference.

5. How likely are you to recommend this app to your social circle?

Findings: User have someone they would greatly like to recommend as they know someone who have issues with the problem space.

6. Any further comment on the model that was not covered previously?

Findings: User felt that the app is too monotonous - they deem the app being too strictly business, where each key page are similar to one another. The user thought that having different landing page appearance for each key feature will greatly help the user to be motivated to explore and use the app. They believe that mental health app should not be monotonous to not lead to another mental health issue - being bored with the page may cause annoyance and frustration.

Cognitive Walkthrough

Tasks:

1. Select the express tactical breathing

Cognitive Walkthrough Task	Is it inline with our existing mental model?	Is the action “visible”	Recognition as correct action	Will we understand feedback
Tactical breathing	Yes	Yes (visual but not audio)	Yes	Yes
Express mode	Yes	No → system status is not visible Improvement: having a clear system status indicator (e.g. green light/red light for successful/unsuccessful synchronization	No → even without successfully synchronizing, there is no indicator that the synchronization has been made or not Improvement: System status which was suggested previously	No → no feedback of any kind except error when clicking the “Check heart rate via healthkit” Improvement: disabling the button if synchronization is not made

2. Synchronize with HealthKit

Cognitive Walkthrough	Is it inline with our existing	Is the action “visible”	Recognition as correct action	Will we understand
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Task	mental model?			feedback
Select tactical breathing	Yes	Yes (visual but not audio)	Yes	Yes
Normal mode	Yes	Yes (visual but not audio)	Yes	Yes
Disclaimer	Yes	Yes (visual but not audio)	Yes	Yes
Proceed from slider on stress level	Yes	Yes (visual but not audio)	Yes	Yes
Select automatic heart rate counting	Yes	Yes (visual but not audio)	Yes	Yes
Synchronizing with HealthKit in normal tactical breathing	Yes	No → system status is not visible Improvement: having a clear system status indicator (e.g. green light/red light for successful/unsuccessful synchronization	No → even without successfully synchronizing, there is no indicator that the synchronization has been made or not Improvement: System status which was suggested previously	No → no feedback of any kind except error when clicking the “Check heart rate via healthkit” Improvement: disabling the button if synchronization is not made

3. Activate audio prompt

Cognitive Walkthrough Task	Is it inline with our existing mental model?	Is the action “visible”	Recognition as correct action	Will we understand feedback
Tactical breathing	Yes	Yes (visual but not audio)	Yes	Yes
Customize settings	Yes	Yes (visual but not audio)	Yes	Yes
Activating audio prompt	Yes	Yes (visual but not audio)	Yes, but no Improvement: Once audio prompt is activated, the voice feedback should say something like “audio prompt activated”. This will help user recognize the correct action.	No → there seems to be a UI (design) failure. Once the switch button is tapped, the color is gone and the slider only moves left and right without any color/other indicator. Improvement: fixing the UI by making sure the slider button is working as it should.

NASA-TLX

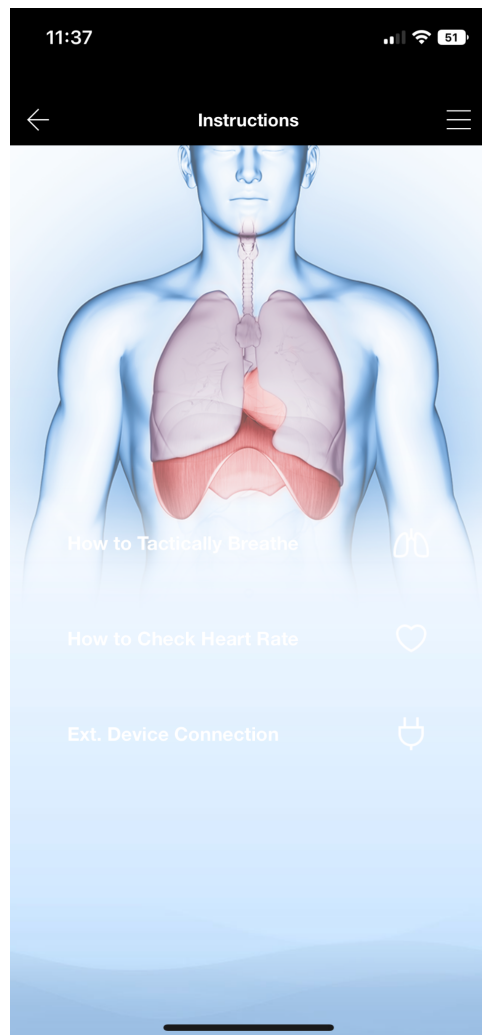
(See PDF)

Recommendation

After careful exploration, turns out the visual prompt for tactical breathing can be customized. The default is the sphere, but a better presentation, box, exists. This should be made the default setting as the box prompt provides the most accurate information without violating Wickens' second principle of absolute judgment limit. User freedom should also be enhanced by being able to customize the font size, which relates to accessibility and making display legible

Appendix A

Figure 1. Screenshot of Instruction page for Tactical Breathing



This screenshot is taken showing how not legible the text are in contrast to the background.